



## Power Markets in India

**For Prelims:** [Indian Energy Exchange Procurement](#), [Electricity Act 2003](#), [Central Electricity Regulatory Commission](#)

**For Mains:** [Regulation of Discoms & Significance of Power Sector of India](#)

[Source: IE](#)

### Why in News?

Recently, the government has allowed the **trading of surplus electricity** generated from “linkage coal” in the country's power markets amid increasing demand during the summer.

- Coal linkages are **government-allocated resources** to **thermal units** based on long-term [power purchase agreements \(PPAs\)](#) with distribution companies to ensure reliable and consistent [coal supply](#) for electricity generation.

### What are Power Markets of India?

- **About:**
  - [Power markets](#) in India represent a system where electricity is traded through various mechanisms and platforms like **power exchanges**, allowing for **flexible and efficient** allocation of electrical power.
- **Power Exchange:**
  - **Power exchanges** are a key infrastructure within power markets that **enable the buying and selling of electricity through transparent** and competitive processes, thereby contributing to the overall efficiency and reliability of the electricity supply system.
  - **Structure and Evolution:**
    - Power exchanges were **first introduced in Europe** in 1990-91 and now operate in about 50 countries worldwide.
    - In India, the [Electricity Act of 2003](#) established the framework for exchange operations, and exchanges commenced in 2008.
      - The [spot market](#) was introduced in 2020 to enhance flexibility and responsiveness.
  - **Trading Mechanism:**
    - **Bidding Process:** Buyers make bids for purchasing electricity, and sellers make offers to sell.
    - **Market Clearing Price:** The equilibrium of demand bids and supply offers determines the **market clearing price** at which electricity is traded.
  - **Categories of Power Markets:**
    - **Spot Market:**
      - Real-time market (RTM) for near-immediate delivery.
      - The intraday market for same-day trades hours before delivery.
    - **Contract Markets:**

- **Day-ahead market (DAM) for closed auctions** in 15-minute time blocks for the following day.
- **Term-ahead market (TAM) for trades from 3 hours to 11 days** in advance.
- **Benefits of Power Markets:**
  - **Flexibility:** Generators can respond to short-term demand fluctuations and sell surplus power **independently of long-term power** purchase agreements (PPAs).
  - **Transparency and Reliability:** Price-based demand response involves multiple parties, **resulting in greater transparency** and reliability compared to bilateral contracts.
  - **Resource Optimisation:** Market-driven approaches enable generators to **optimise their output and revenue**, while utilities can meet variable power demands more efficiently.
- **Major Power Exchanges in India:**
  - **Indian Energy Exchange Ltd (IEX):** Dominates with over 90% market share.
    - Traded about 110 billion units (BU) of electricity in FY 2023-24, growing 14% year-on-year.
  - **Power Exchange India Limited (PXIL):** It is India's first institutionally promoted power exchange which has been providing innovative and credible solutions since 2008.
  - **Hindustan Power Exchange Ltd (HPX):** It provides a comprehensive market platform for different electricity products.
- **Regulation:** All exchanges are regulated by the [Central Electricity Regulatory Commission \(CERC\)](#).
  - CERC intends to **promote competition, efficiency and economy** in bulk power markets, improve the **quality of supply, promote investments** and advise the government on the removal of institutional barriers to bridge the demand-supply gap.
  - It is a **statutory body** functioning with quasi-judicial status under the Electricity Act 2003.
  - **Electricity Act 2003:** [The Electricity Act, 2003](#) provides for **Electricity Regulatory Commissions** at both the **central and state levels** (CERC and SERCs).

## Instruments Related to Power Market

- **Renewable Energy Certificates (REC) Mechanism:**
  - It allows utilities to meet **renewable purchase obligations (RPOs)** by buying RECs, each representing 1 MWh of renewable electricity.
    - RPO was instituted in 2011, it is a mandate that **requires large power procurers to buy a predetermined** fraction of their electricity from renewable sources.
  - States with **insufficient renewable capacity** can purchase RECs to meet green energy targets.
- **Power Purchase Agreements (PPAs):**
  - These are **long-term agreements** (typically 25 years) between electricity generators and buyers (usually public utilities).
  - It involves **committing generators to supply power at fixed rates**, locking in significant generating capacity.
  - They are inflexible and **unable to adapt to dynamic market conditions**.

## What are the Challenges Faced by Power Markets in India?

- **Transmission Bottlenecks:** Insufficient transmission infrastructure **creates congestion in the grid, hindering the efficient flow of electricity** from generation sources to consumers.
  - This is particularly **problematic for integrating renewable energy sources** located far from demand centres.
- **Financial Health of Discoms:** Distribution Companies (Discoms) have weak finances due to high losses from inefficiencies, theft, and unpaid bills, limiting their ability to invest in grids and pay generators promptly, impacting the market.
  - For example, **transmission and distribution losses (T&D) in India are more than 20% which is more than the world average**.
- **Coal Dependence and Price Volatility:** India's heavy reliance on coal for power generation **exposes the market to price fluctuations in the global coal market**. This

disrupts power pricing stability and can strain generator margins.

- **Market Design and Infrastructure:** Developing robust market designs, including **market coupling and capacity markets**, requires substantial investment in infrastructure and coordination.
- **Inconsistent Policy and Regulatory Framework:** A complex and evolving regulatory environment creates uncertainty for investors in the power sector.
- **Limited Market Products:** The current power market primarily focuses on short-term trading than developing a **wider range of market products**, such as **futures and derivatives contracts**.

## Note

- **Market Coupling:** Market coupling is a mechanism used in electricity markets to **integrate and coordinate the trading of electricity across different regions** or countries.
  - It aims **to achieve a single market clearing price for electricity** by matching supply and demand bids from all participating power exchanges or market platforms.
- **Capacity Markets:** Capacity markets are mechanisms within the electricity sector where **generators are paid not only for the electricity they produce and sell but also for their capacity to generate electricity**.

## What are the Steps Needed to Strengthen Power Markets in India?

- **Promote Market-Based Pricing:** The [Economic Survey 2022-23](#) highlights the need for a **market-driven approach** to power pricing. This could involve reforms like **phasing out subsidised electricity** for high-income consumers and allowing generators more flexibility in setting **prices based on demand and supply**.
- **Introduce Market Coupling:** Implementing market coupling to unify power prices and develop **capacity markets** with incentives and **support for grid reliability**.
- **Address Discoms' Financial Issues:** Measures like improving **billing and collection systems**, reducing power theft, and exploring [public-private partnerships](#) can improve their financial health.
- **Encourage Renewable Energy Integration:** Promote renewable energy and [smart grid technologies](#) to improve **grid management**, efficiency, and reliability through better forecasting, storage, metering, data analytics, and automation.
- **Harmonize Regulatory Framework:** Develop uniform regulations across states to reduce **inconsistencies and create a cohesive market environment**.
- **Strengthen Transmission Infrastructure:** Using [drones](#) for **line inspection** and maintenance in tough terrains and **exploring advanced materials for lighter, stronger, and more efficient transmission towers** can help in strengthening the transmission infrastructure.

### Drishti Mains Question:

Q. Examine the challenges faced by power markets in India and discuss the steps needed to overcome these challenges.

## UPSC Civil Services Examination, Previous Year Questions (PYQs)

Q. Which one of the following is a purpose of 'UDAY', a scheme of the Government? (2016)

- (a) Providing technical and financial assistance to start-up entrepreneurs in the field of renewable sources of energy
- (b) Providing electricity to every household in the country by 2018
- (c) Replacing the coal-based power plants with natural gas, nuclear, solar, wind and tidal power plants over a period of time

**(d)** Providing for financial turnaround and revival of power distribution companies

**Ans: (d)**

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